ANALYSIS

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Adenoidal tissue regrowth post-adenoidectomy using suction cautery *versus* conventional curette among pediatric patients in a tertiary care center

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Citation

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ABSTRACT

Adenoidectomy is one of the most common surgical techniques performed in Otorhinolaryngology. Several approaches have been described for adenoidectomy. This paper aims to compare between the Conventional Curette Adenoidectomy (CCA) and the Suction Cautery Adenoidectomy (SCA) in terms of the operation duration, intraoperative bleeding, and postoperative reoccurrence of the symptoms. A retrospective, randomized case-control study was designed to assess these objectives. Data of 241 patients were collected from King Abdul-Aziz University hospitals' medical records between January 1st, 2013 and December 31st, 2019, and statistical analysis was performed. Two hundred forty-one patients were enrolled in the study, with ages ranging from 1 to 14 years. Most of the patients were males (60.2%). Most of the patients who required a second operation belonged to the CCA group (9 out of 10). The regrowth of adenoidal tissue was faster among the CCA group compared to SCA. There was a statistically significant difference between the techniques regarding the reoccurrence of snoring. The rest of the symptoms as well as post-operative bleeding were not statistically significant. In conclusion, while revision adenoidectomy was more in those who underwent CCA, further investigations need to be conducted to ensure the statistically significant difference between the two approaches regarding the duration of operation, tissue regrowth, and the amount of bleeding.

Keywords: Adenoidectomy, Conventional Curette, Suction Cautery, pediatric patients, postoperative symptoms.

1. INTRODUCTION

Adenoids are a mass of lymphoid tissue that occupies the roof of the nasopharynx. They are usually small in size at the time of birth. However, they continue to grow progressively with the increased hyperactivity of the immune system (Kim et al., 2015). Their large size begins to interfere with the normal flow of air through the nasopharynx. It begins to cause significant clinical manifestations like nasal obstruction, mouth breathing, snoring, hyponasal speech, and sometimes obstructive sleep apnea (Meyer and Marshall, 1986). Furthermore, delayed management of the condition can lead to significant dentofacial complications and obstruct Eustachian Tube's opening (ET), leading to secretory otitis media that might complicate learning disabilities delayed developmental milestones as a result of the continuous conductive hearing loss (Lehmann et al., 1979).

Adenoid hypertrophy (AH) is one of the most common conditions among pediatric age groups. In a systematic review and meta-analysis, the average prevalence of adenoid hypertrophy was estimated as 49.70% of the total number of patients (Pereira et al., 2018). Many regimens have been reported in the management of adenoid hypertrophy. Medical treatment was prescribed in case of acute and chronic infectious AH. A combination of Penicillin groups like ampicillin and clavulanic acid was described in the literature (Rajeshwary et al., 2013). Furthermore, intranasal corticosteroids like fluticasone propionate nasal drops and intranasal mometasone reported considerable results and showed significant improvements in nasal obstruction, rhinorrhea, snoring, night cough, and night sleep apnea (Demirhan et al., 2010; Chohan et al., 2015).

Although the previously mentioned techniques discussed promising results and showed enhancement of the symptoms, surgical adenoidectomy remains the gold standard procedure in managing recurrent AH with persistent symptoms not responding to medical treatment until this time (Randall et al., 1991). Several surgical approaches have been described in adenoidectomy. Suction Cautery Adenoidectomy (SCA) was reported as the most surgical technique adopted by the members of The American Society of Pediatric Otolaryngology (ASPO) (Walner et al., 2007).

Many factors have contributed to SCA's popularity and made it more preferred than the standard conventional curettage. Some of these factors are accurate surgical resection, decreased operation duration, reduced and significant decline in the postoperative complications, especially secondary bleeding (Clemens et al., 1998; Hajr et al., 2011). However, some studies reported no significant difference between the two approaches (Jonas et al., 2007). Most literature compared two techniques regarding blood loss and the duration of the operation. However, to the best of our knowledge, no study discussed the tissue regrowth at the two approaches, especially in the Arab region. Hence, our main objective is to assess the post-adenoidectomy tissue regrowth between SCA and traditional curettage at King Abdul-Aziz University Hospital, Jeddah, Saudi Arabia.

2. METHODOLOGY

Study design and setting

A retrospective, randomized, case-control study was designed to assess the postoperative recurrence of the symptoms among patients who underwent CCA and SCA. The study was conducted in the Department of Otorhinolaryngology, King Abdul-Aziz University hospital, Saudi Arabia.

Study participants

A total of 241 patients who underwent adenoidectomy between January 1st 2013 to December 31st 2019 were recruited in the study group.

Data collection

Data was collected using Phoenix, the electronic medical records system at King Abdul-Aziz University hospital. The total sample size was picked through random sampling with predetermined power analysis =82%. They were divided into two subgroups: 145 CCA, 93 SCA, and 3 who underwent both techniques. Certain factors were considered for the statistical analysis, like age of the patient at the time of operation, the grade of adenoidal hypertrophy, date of operation, the surgical technique applied, and duration of the procedure. Those with insufficient data were excluded from the study.

The included subjects were interviewed *via* telephone, and information regarding post-adenoidectomy was obtained to have adenoidal recurrence and degree of post-adenoidectomy hemorrhage. Those with bleeding requiring an ER visit were included, and adenoidal recurrence was defined as the recurrence of symptoms such as snoring, mouth-breathing, and the need for a revision adenoidectomy.

Adenoidal nasopharyngeal ratio

Patients were examined using Lateral Skull x-ray lateral view to assess the Adenoidal Nasopharyngeal Ratio (ANR). We adopted Clemens classification of ANR based on the degree of choanal obstruction (Clemens et al., 1998).

The system classified ANR into four grades:

Grade I: Adenoidal tissue is filling 1:3, the vertical height of the choana.

Grade II: Adenoidal tissue is filling almost 2/3 of the total vertical height.

Grade III: Adenoidal tissue is filling almost- but not wholly- the choana's total height.

Grade IV: Adenoidal tissue is filling the total vertical height of choana.

The adenoidal size was determined using Fjjioka's system for assessing the ANR (Fujioka et al., 1979). Firstly, we measured the distance between an imaginary line that parallels the anterior basiocciput to the adenoid pad's maximal convexity. Then, the nasopharynx is calculated from the anteroinferior point of the sphenobasioccipital synchondrosis. Based on the previous assessment, ANR can then be calculated.

Ethical approval

The objectives and procedures of the study were explained to the participants, and informed consent was obtained from all the participants. The study procedures were reviewed and approved by the Research Ethics Committee (REC), the unit of Biomedical ethics- KAUH. The ethical approval reference number is 438-19.

Statistical analysis

Data were checked for correctness and completeness. Descriptive statistics were used to present the categorical variables in frequencies and percentages, while the continuous variables as mean ± standard deviation. Continuous variables, e.g., age, percentage of obstruction, were checked for normality by the Kolmogorov Smirnov test, and the Shapiro Wilk test. Both tests revealed non-normal distribution. Therefore, the Mann-Whitney U test was used to compare cases that underwent curette and cautery in terms of these variables. The associations between postoperative complications (The need for a second operation, snoring, mouth breathing, postoperative bleeding) and adenoidectomy techniques (CCA and SCA) were checked by Chi-square test. The analysis was performed in 95% confidence interval using the Statistical Package for Social Science (SPSS) version 25 (IBM, Armonk, NY, USA).

3. RESULTS

A total of 241 adenoid surgery cases were included in this study. Among them, 145 (60.2%) were male, and the rest were female. The majority were Saudi nationals (81.7%). The mean age of them was 5.41 ± 3.11 years. Specific procedures they underwent are as follows: Adenotonsillectomy (61.4%), Adenotonsillectomy + Myringotomy (16.6%), Adenoidectomy (13.3%), and Adenoidectomy + Myringotomy (8.7%). The surgical technique was CCA for 145 (60.2%) cases and SCA for 93 (38.6%) cases. Three patients required a combination of both techniques (Table 1).

Table 1 Baseline clinical characteristics of all cases (n = 241)

Characteristics	N (%)
Gender	
Male	145 (60.2)
Female	96 (39.8)
Nationality	
Saudi	197 (81.7)
Yemeni	23 (9.5)
Palestinian	9 (3.7)
Egyptian	5 (2.1)
Chadian	1 (0.4)
Indian	1 (0.4)
Lebanese	1 (0.4)
Moroccan	1 (0.4)
Pakistani	1 (0.4)
Sudanese	1 (0.4)

Syrian	1 (0.4)
Age (mean ± SD)	5.41 ± 3.11
Procedure they underwent	
Adenotonsillectomy	148 (61.4)
Adenotonsillectomy + myringotomy	40 (16.6)
Adenoidectomy	32 (13.3)
Adenoidectomy + Myringotomy	21 (8.7)
Adenoidectomy technique	
CCA	145 (60.2)
SCA	93 (38.6)
CCA + SCA	3 (1.2)

Results are presented as number (% of cases) or mean ± SD.

Most numbers of the surgeries happened in the year 2015 (28.2%), and the least number occurred in the year 2017 (5.8%) (Figure 1). The complication rates after surgery were as follows needed second surgery (4.1%), developed snoring (26.6%), mouth bleeding (27.8%), and postoperative bleeding (2.1%). The mean time interval between first and second surgery was 2.64 ± 1.249 years. Apart from snoring, the aforementioned complications were not statistically significant. Ten out of 241 cases required a revision adenoidectomy; 90% of them belonged to the CCA group (Table 2 and 3).

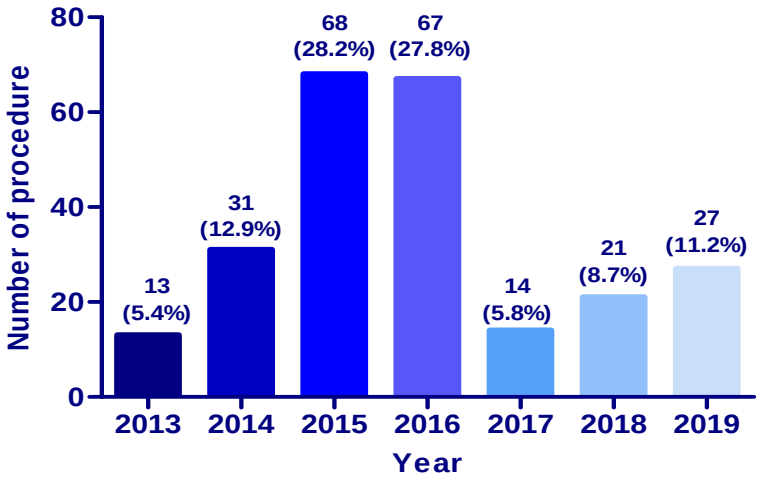

Figure 1 The number of procedures per year among all cases. Results are presented as number and % of cases.

Table 2 Distribution of all cases by post-adenoidectomy manifestations complications

Manifestations	Yes/ No	N (%)
Needed a second operation	Yes	10 (4.1)
	No	231 (95.9)
Snoring	Yes	64 (26.6)
	No	177 (73.4)
Mouth breathing	Yes	67 (27.8)
	No	174 (72.2)
PO bleeding	Yes	5 (2.1)
	No	236 (97.9)

Results are presented as number and % of cases.
PO: Post-operative.

Table 3 Comparison between cases underwent CCA and patients experienced SCA regarding post-adenoidectomy manifestations complications.

Variables	CCA (n = 145) N (%)	SCA (n = 93) N (%)	Odds ratio	p-value
Needed a second operation	9 (6.2)	1 (1.1)	0.164	0.054
Snoring	45 (31.0)	18 (19.4)	0.533	0.046*
Mouth breathing	45 (31.0)	21 (22.6)	0.648	0.155
PO Bleeding	3 (2.1)	2 (2.2)	1.040	0.966

Results are presented as number and % of cases. *Significant at $p \leq 0.05$.

CCA: Conventional Curette Adenoidectomy. SCA: Suction Cautery Adenoidectomy. PO: Post-operative.

The most time-consuming operation was 'Adenotonsillectomy + Myringotomy', as it took a mean duration of 50.08 ± 19.77 minutes to complete. The least time consuming one was only 'adenoidectomy', it took 21.22 ± 15.90 minutes to finish (Table 4). The mean operation duration was not statistically significantly different between the two adenoidectomy techniques. But overall, Adenoidectomy + Myringotomy, Adenotonsillectomy, and Adenotonsillectomy + Myringotomy curettes took more time to complete than the suction cautery technique (Table 5). The adenoidal hypertrophy was significantly more among curette cases than suction cautery cases. The curette cases had a mean obstruction percentage of 80.76 ± 13.95 percent, whereas the suction cautery cases had a mean obstruction percentage of 70.53 ± 15.94 percent, (p= 0.013) (Figure 2). The mean time interval between first and second operation for all cases was 2.64 ± 1.249 years, for curette cases 2.42 ± 1.201 years, and for cautery cases 4 years (only 1 case) (Figure 3).

Table 4 Distribution of duration of operation for all cases among different procedures.

Type of operation	Duration (min)
Adenoidectomy	21.22 ± 15.90
Adenoidectomy + Myringotomy	36.29 ± 13.76
Adenotonsillectomy	36.62 ± 18.36
Adenotonsillectomy + Myringotomy	50.08 ± 19.77

Results are presented as mean ± SD.

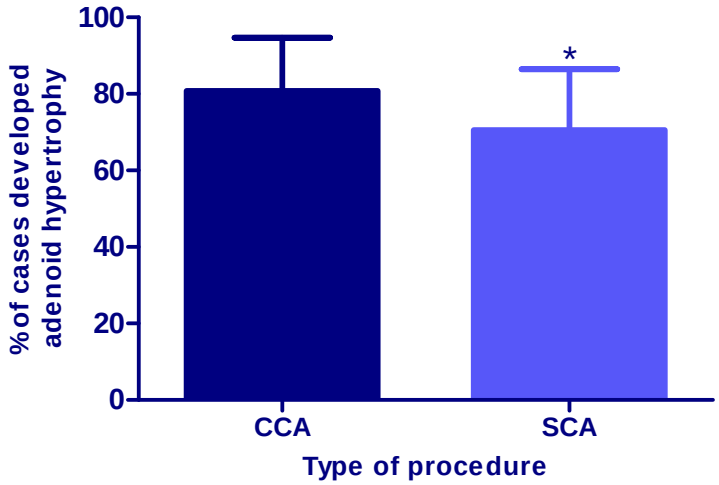

Figure 2 Comparison between cases that underwent CCA and SCA in terms of adenoidal hypertrophy.

Results are presented as % of cases. *Significant at $p \leq 0.05$.

CCA: Conventional Curette Adenoidectomy. SCA: Suction Cautery Adenoidectomy.

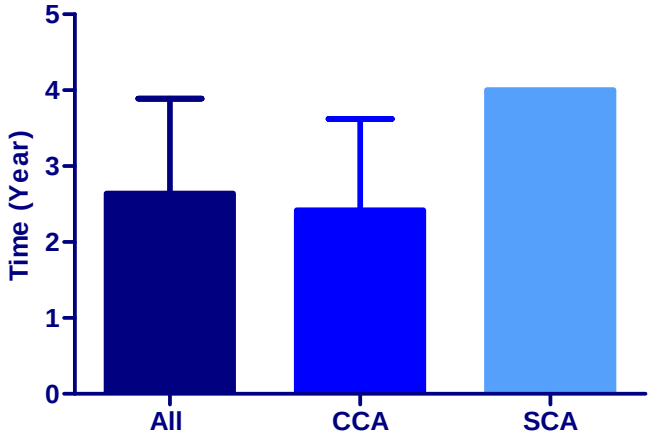

Figure 3 Comparison between all cases, patients underwent CCA and patients underwent SCA in terms of the time interval between first and second operation.

Results are presented as % of cases.

CCA: Conventional Curette Adenoidectomy. SCA: Suction Cautery Adenoidectomy.

Table 5 Comparison of duration of operation between cases that underwent CCA and SCA.

Type of operation	CCA Duration (min)	SCA Duration (min)	p-value
Adenoidectomy	16.90 ± 8.69	27.45 ± 22.99	0.169
Adenoidectomy + Myringotomy	39.07 ± 13.90	30.71 ± 12.57	0.056
Adenotonsillectomy	38.12 ± 20.72	33.40 ± 12.76	0.305
Adenotonsillectomy + Myringotomy	58.33 ± 21.68	45.12 ± 17.11	0.053

Results are presented as mean ± SD.

CCA: Conventional Curette Adenoidectomy. SCA: Suction Cautery Adenoidectomy.

4. DISCUSSION

Adenoidectomy is one of the most common surgical procedures performed by otolaryngologists. Several approaches have been described and compared regarding the operation, intra-operative bleeding, and postoperative complications like bleeding, tissue regrowth and recurrence of snoring, and airway obstructions (Pereira et al., 2018). CCA is one of the techniques described for the management of the condition. It is achieved by introducing a trans-oral curette and scraping the hyperplastic lymphoid tissue in the nasopharynx. However, several complications have been reported about this technique, especially the incomplete removal of the adenoid tissue (Some literature stat an average of 30% of the tissue remains after the operation), bleeding, and postoperative tissue regrowth (Zainea, 2011). Because of the previously mentioned complications, most otolaryngologists adopted SCA as an alternative procedure to conventional curettage (Walner et al., 2007). SCA is mainly achieved by introducing a malleable suction coagulator to the nasopharynx by passing behind the palate. It is placed against the adenoidal tissue, and a diathermy current is introduced. The hypertrophied adenoid is removed by diathermy-mediated coagulation and suction effect of the malleable (Hartley et al., 1998). The comparison between the two techniques has not been settled yet. However, some papers have discussed the difference between the two mechanisms regarding the operation duration, intraoperative bleeding, postoperative bleeding, and tissue regrowth.

In our study, we found that adenoidectomy (Alone or combined with other surgeries) is more common among males (60.2%) than females (38.8%), and the mean age for the enrolled patient is 5.41 years old. These results were consistent with the literature findings about the patients' mean age and sex (Clemens et al., 1998; Skilbeck et al., 2007). A total of 10 patients developed adenoidal regrowth during our follow-up period. Nine of which (90%) were of the CCA group. While the difference was not statistically significant (P=0.054), it was clear that SCA was superior to CCA in removing adenoidal tissue, leaving no remaining parts for potential regrowth and recurrent symptomatic obstruction. These results were inconsistent with Jonas et al., who reported a statistically significant difference between the two procedures regarding adenoidal tissue regrowth. However, he doubted any clinical significance between the two approaches (Jonas et al., 2007). We also noticed that the number of patients who were complicated by snoring and mouth breathing -as a consequence of adenoidal regrowth- was more in the CCA group than the SCA

group. The difference was statistically significant between the two methods for snoring (P=0.046) but not for mouth breathing (P=0.155). It is interesting to report that adenoidal hypertrophy symptoms- like mouth breathing and snoring- emerge when the size of the tissue exceeds 50% of the posterior choanae (Elwany, 1987; Wormald and Prescott, 1992). This indicates one of two possibilities, either the technique is ineffective in completely removing adenoidal tissue and the remaining part is quite large- Hence, the recurrence of symptoms. The rate of tissue regrowth after CCA is faster in comparison to SCA. We like to consider both two possibilities, as our study showed that adenoidal hypertrophy was significantly more apparent among the CCA group compared to the SCA group (P=0.013). Besides, we estimated that the average tissue regrowth time after CCA is only 2.42 years compared to 4 years in SCA. Clemens et al. reported an equal postoperative adenoid-choanal ratio between the two techniques (Clemens et al., 1998). However, a significant limitation in their study was the number of participants reaching 34 patients only, which makes the results quite questionable. Further literature needs to be conducted to investigate the first possibility and provide statistical analysis of the postoperative adenoidal mass between the two techniques.

Multiple studies discussed postoperative bleeding as the main difference between the two techniques. However, there was no consensus between the reported results and the degree of bleeding. Skilbeck et al. reported no case of postoperative bleeding after SCA. However, the study was not comparing the two techniques. It only described the outcomes of SCA regarding postoperative complications (Skilbeck et al., 2007). On the other hand, Clemens et al. (1998) reported a statistically significant decrease in SCA's average blood loss compared to CCA. However, there were no physiological complications based on the amount of blood loss in both techniques. Hajr et al. (2011) also discussed the possibility of postoperative bleeding after CCA compared to SCA. Still, the difference was not statistically significant as it was only one case-out of 43 patients enrolled in the CCA group- who underwent a second operation to manage bleeding. In our study, we reported postoperative bleeding in both of the techniques. However, there was no statistically significant difference between the two approaches (P=0.966). This inconsistency between the literatures necessitates further investigations to assess the presence of postoperative hemorrhage and its consequences.

Duration of the surgery was studied as another factor in the difference between the two techniques. Hajr et al. (2011) reported a significant decrease in operation duration with SCA compared to CCA adenoidectomy. They justified the increased time interval for CCA is caused by difficulty in hemostasis and less optimal surgical view due to difficulty in visualizing the field upon using a curette. In contrast, recurrent blockage of the cautery was the leading cause for a prolonged time interval in SCA. In our study, the mean duration for performing SCA (27.45 minutes) was longer than the curette (16.90 minutes). However, the difference was statistically insignificant (P=0.169). A possible reason for such findings is that surgeons were more familiar with CCA than SCA. This led to a slightly better performance with CCA cases. However, when adenoidectomy was combined with another operation like myringotomy or tonsillectomy, the time interval was decreased when adopting SCA than CCA. Still, the difference was not statistically significant in both procedures (P=.056, P=0.305, respectively). We noticed that the meantime for all of the operation is longer when compared with other literature (Hajr et al., 2011; Skilbeck et al., 2007). This is because most of the operations are not performed by specialist surgeons only. Junior and senior residents take part in the procedure to gain further experience. Also, the surgeons take the time to explain the procedures for the junior doctors attending the operation. Our results were consistent with Clemens et al. (1998) who reported no difference in operation duration upon adopting each technique. Jonas et al. (2007) reported no significant difference between Suction Diathermy Adenoidectomy (SDA) and CCA when performing adenoidectomy alone. Nevertheless, when combining the operation with tonsillectomy, SDA took a significantly longer duration than conventional curette. However, their results might need further investigation as the authors notified that the duration of the procedure was not completely recorded in case of adenotonsillectomy.

As mentioned above, there were conflicting results about both techniques' effect on the operation's duration either when performing adenoidectomy alone or when combining with another procedure. Hence, further investigations need to be conducted to assess this factor and determine which of the previous findings was more likely to be true.

5. CONCLUSION

SCA and CCA are among the most adopted techniques upon performing adenoidectomy. Several papers discussed SCA's superiority over CCA in decreasing the rate of adenoidal regrowth, reducing operation time, and decreasing postoperative complications. However, our results indicated no significant difference in all these factors between the two techniques. Further investigations need to be conducted to assess these findings and compare them with the previous literature.

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Author contributions

All Authors contributed to the data collection process and the writing of the manuscript.

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Informed consent

The objectives and procedures of the study were explained to the participants and informed consent was obtained from all of the participants.

Data and materials availability

All data associated with this study are present in the paper.

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